General

Title

Chronic obstructive pulmonary disease (COPD): hospital 30-day, all-cause, risk-standardized mortality rate following COPD hospitalization.

Source(s)

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific measures updates and specifications report: hospital-level 30-day risk-standardized mortality measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 98 p. [29 references]

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Outcome

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure estimates a hospital-level 30-day risk-standardized mortality rate (RSMR) for patients discharged from the hospital with either a principal diagnosis of chronic obstructive pulmonary disease (COPD) or a principal diagnosis of respiratory failure and secondary diagnosis of COPD with exacerbation. Mortality is defined as death from any cause within 30 days of the start of the index admission.

The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for individuals who are 65 years and older and are Medicare Fee-for-Service (FFS) beneficiaries hospitalized in non-federal short-term acute care hospitals (including Indian Health Services hospitals) and critical access hospitals.

Rationale

Measurement of patient outcomes allows for a more comprehensive view of quality of care, encompassing

more than that captured by individual process-of-care measures. Complex and critical aspects of care, such as communication between providers, prevention of and response to complications, patient safety, and coordinated transitions to the outpatient environment, all contribute to patient outcomes but are difficult to measure by individual processes (Krumholz et al., 2007; Bradley et al., 2006). Clinical trials and observational studies suggest that several aspects of care provided to patients hospitalized for exacerbations of COPD can have significant effects on mortality, thus supporting the essential construct of mortality as an appropriate outcome to measure quality (Global Initiative for Chronic Obstructive Lung Disease [GOLD], 2009; National Collaborating Centre for Acute and Chronic Conditions, 2010; Walters et al., 2009; Lightowler et al., 2003).

The goal of outcomes measurement is to evaluate patient outcomes after accounting for patients' conditions at the time of hospital admission (hospital case-mix). This mortality measure was developed to identify hospitals whose performance is better or worse than would be expected based on their patient case-mix, and therefore promote hospital quality improvement and better inform consumers about care quality.

Evidence for Rationale

Bradley EH, Herrin J, Elbel B, McNamara RL, Magid DJ, Nallamothu BK, Wang Y, Normand SL, Spertus JA, Krumholz HM. Hospital quality for acute myocardial infarction: correlation among process measures and relationship with short-term mortality. JAMA. 2006 Jul 5;296(1):72-8. PubMed

Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. Bethesda (MD): Global Initiative for Chronic Obstructive Lung Disease (GOLD); 2009. 93 p. [447 references]

Krumholz HM, Normand SL, Spertus JA, Shahian DM, Bradley EH. Measuring performance for treating heart attacks and heart failure: the case for outcomes measurement. Health Aff (Millwood). 2007 Jan-Feb;26(1):75-85. PubMed

Lightowler JV, Wedzicha JA, Elliott MW, Ram FS. Non-invasive positive pressure ventilation to treat respiratory failure resulting from exacerbations of chronic obstructive pulmonary disease: Cochrane systematic review and meta-analysis. BMJ. 2003 Jan 25;326(7382):185. [16 references] PubMed

National Collaborating Centre for Acute and Chronic Conditions. Chronic obstructive pulmonary disease: management of chronic obstructive pulmonary disease in adults in primary and secondary care (partial update). London (UK): National Institute for Health and Clinical Excellence (NICE); 2010. (Clinical guideline; no. 101).

Walters JA, Gibson PG, Wood-Baker R, Hannay M, Walters EH. Systemic corticosteroids for acute exacerbations of chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2009; (1):CD001288.

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research & Evaluation (CORE). Hospital-level 30-day mortality following admission for an acute exacerbation of chronic obstructive pulmonary disease: measure methodology report. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2011 Sep 29. 44 p. [23 references]

Primary Health Components

Chronic obstructive pulmonary disease (COPD); respiratory failure; acute exacerbation of COPD; 30-day mortality rate

Denominator Description

The measure cohort consists of admissions for Medicare Fee-for-Service (FFS) beneficiaries aged 65 years or older discharged from non-federal acute care hospitals and critical access hospitals, having a principal discharge diagnosis of chronic obstructive pulmonary disease (COPD), as well as those with a principal discharge diagnosis of respiratory failure and secondary diagnosis of COPD with exacerbation.

The risk-standardized mortality rate (RSMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix.

See the related "Denominator Inclusions/Exclusions" field.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the measure cohort.

See the *2017 Condition-specific Measures Updates and Specifications Report. Hospital-level 30-day Risk-standardized Mortality Measures* for more details.

Numerator Description

The measure counts death from any cause within 30 days of the start of the index admission.

The risk-standardized mortality rate (RSMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted based on the hospital's performance with its observed case mix.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the outcome.

See the *2017 Condition-specific Measures Updates and Specifications Report. Hospital-level 30-day Risk-standardized Mortality Measures* for more details.

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Chronic obstructive pulmonary disease (COPD) is a priority condition for outcomes measure development because it is a leading cause of morbidity and mortality. COPD affects at least 15 and as many as 24 million individuals in the United States (U.S.), and is the nation's third leading cause of death (National Heart, Lung, and Blood Institute [NHLBI], 2009; Centers for Disease Control and Prevention [CDC], 2011; Wier et al., 2011; Xu et al., 2013; American Lung Association, 2016). Studies report that in-hospital mortality rates for patients hospitalized for exacerbations of COPD range from 2% to 5% (Agency for Healthcare Research and Quality [AHRQ], 2009; Patil et al., 2003; Tabak et al., 2009; Lindenauer et al., 2006; Dransfield et al., 2008) and 30-day mortality rates range from 3% to 9% (Faustini et al., 2008; Fruchter & Yigla, 2008; Lindenauer et al., 2013).

In 2011, COPD was one of the top 20 most expensive conditions treated in U.S. hospitals (Torio & Andrews, 2013). It was also one of the top 20 most expensive conditions billed to Medicare, accounting for nearly $4,074,000 of total hospital charges billed to Medicare (Torio & Andrews, 2013).

Evidence for Additional Information Supporting Need for the Measure

Agency for Healthcare Research and Quality (AHRQ). Healthcare Cost and Utilization Project (HCUP) statistics on hospitals stays, 2009. [internet]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2009 [accessed 2010 Sep 18].

American Lung Association. Lung health & diseases: how serious is COPD. [internet]. Chicago (IL): American Lung Association; 2016 Nov 1 [accessed 2017 Oct 30].

Centers for Disease Control and Prevention (CDC). Chronic obstructive pulmonary disease among adults--United States, 2011. MMWR Morb Mortal Wkly Rep. 2012 Nov 23;61(46):938-43. PubMed

Dransfield MT, Rowe SM, Johnson JE, Bailey WC, Gerald LB. Use of beta blockers and the risk of death in hospitalised patients with acute exacerbations of COPD. Thorax. 2008 Apr;63(4):301-5. PubMed

Faustini A, Marino C, D'Ippoliti D, Forastiere F, Belleudi V, Perucci CA. The impact on risk-factor analysis of different mortality outcomes in COPD patients. Eur Respir J. 2008 Sep;32(3):629-36. PubMed

Fruchter O, Yigla M. Predictors of long-term survival in elderly patients hospitalized for acute exacerbations of chronic obstructive pulmonary disease. Respirology. 2008 Nov;13(6):851-5. PubMed

Lindenauer PK, Grosso LM, Wang C, Wang Y, Krishnan JA, Lee TA, Au DH, Mularski RA, Bernheim SM, Drye EE. Development, validation, and results of a risk-standardized measure of hospital 30-day mortality for patients with exacerbation of chronic obstructive pulmonary disease. J Hosp Med. 2013 Aug;8(8):428-35. PubMed

Lindenauer PK, Pekow P, Gao S, Crawford AS, Gutierrez B, Benjamin EM. Quality of care for patients hospitalized for acute exacerbations of chronic obstructive pulmonary disease. Ann Intern Med. 2006 Jun 20;144(12):894-903. PubMed

National Heart, Lung, and Blood Institute (NHLBI). Morbidity & mortality: 2009 chart book on cardiovascular, lung, and blood diseases. Bethesda (MD): National Institutes of Health (NIH); 2009 Oct. 116 p.

Overview of hospitalizations among patients with COPD, 2008. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2011 Feb. 11 p. (HCUP statistical brief; no. 106).

Patil SP, Krishnan JA, Lechtzin N, Diette GB. In-hospital mortality following acute exacerbations of chronic obstructive pulmonary disease. Arch Intern Med. 2003 May 26;163(10):1180-6. PubMed

Tabak YP, Sun X, Johannes RS, Gupta V, Shorr AF. Mortality and need for mechanical ventilation in acute exacerbations of chronic obstructive pulmonary disease: development and validation of a simple risk score. Arch Intern Med. 2009 Sep 28;169(17):1595-602. PubMed

Torio CM, Andrews RM. National inpatient hospital costs: the most expensive conditions by payer, 2011. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2013 Aug. 12 p. (HCUP statistical brief; no. 160).

Xu J, Murphy SL, Kochanek KD, Bastian BA. Deaths: final data for 2013. Natl Vital Stat Rep. 2016 Feb 16;64(2):1-119. PubMed

Extent of Measure Testing

Assessment of Updated Models

The chronic obstructive pulmonary disease (COPD) mortality measure estimates hospital-specific 30-day all-cause risk-standardized mortality rates (RSMRs) using a hierarchical logistic regression model. Refer to Section 2 in the original measure documentation for a summary of the measure methodology and model risk-adjustment variables. Refer to prior methodology and technical reports for further details.

The Centers for Medicare & Medicaid Services (CMS) evaluated and validated the performance of the models, using July 2013 to June 2016 data for the 2017 reporting period. They also evaluated the stability of the risk-adjustment model over the three-year measurement period by examining the model variable frequencies, model coefficients, and the performance of the risk-adjustment model in each yea.

CMS assessed logistic regression model performance in terms of discriminant ability for each year of data and for the three-year combined period. They computed two summary statistics to assess model performance: the predictive ability and the area under the receiver operating characteristic (ROC) curve (c-statistic). CMS also computed between-hospital variance for each year of data and for the three-year combined period. If there were no systematic differences between hospitals, the between-hospital variance would be zero.

The results of these analyses are presented in Section 4.3 of the original measure documentation.

COPD Mortality 2017 Model Results

Frequency of COPD Model Variables

CMS examined the change in the frequencies of clinical and demographic variables. Frequencies of model variables were stable over the measurement period. The largest changes in the frequencies (those greater than 2% absolute change) include increases in Asthma (16.3% to 23.8%), Cardio-respiratory failure and shock (35.3% to 40.1%), Other psychiatric disorders (30.4% to 33.1%), Other respiratory disorders (56.9% to 64.2%), and Renal failure (32.9% to 35.0%).

COPD Model Parameters and Performance

Table 4.3.2 in the original measure documentation shows hierarchical logistic regression model variable coefficients by individual year and for the combined three-year dataset. Table 4.3.3 in the original measure documentation shows the risk-adjusted odds ratios (ORs) and 95% confidence intervals for the COPD mortality model by individual year and for the combined three-year dataset. Overall, the variable effect sizes were relatively constant across years. In addition, model performance was stable over the three-year period; the c-statistic remained constant at 0.72.

Refer to the original measure documentation for additional information.

Evidence for Extent of Measure Testing

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific measures updates and specifications report: hospital-level 30-day risk-standardized mortality measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 98 p. [29 references]

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Specified

Target Population Age

Age greater than or equal to 65 years

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Making Care Safer

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

IOM Care Need

Getting Better

IOM Domain

Safety

Data Collection for the Measure

Case Finding Period

Discharges July 1, 2013 through June 30, 2016

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Clinical Condition

Institutionalization

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
An *index admission* is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

- Principal discharge diagnosis of chronic obstructive pulmonary disease (COPD) or principal discharge diagnosis of respiratory failure with a secondary diagnosis of COPD with exacerbation*
- Enrolled in Medicare Fee-for-Service (FFS) Part A and Part B for the 12 months prior to the date of admission, and enrolled in Part A during the index admission
- Aged 65 or over
- Not transferred from another acute care facility

*International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes used to define the COPD cohort for discharges on or after October 1, 2015:

- J41.8 Mixed simple and mucopurulent chronic bronchitis
- J42 Unspecified chronic bronchitis
- J43.0 Unilateral pulmonary emphysema [MacLeod's syndrome]
- J43.1 Panlobular emphysema
- J43.2 Centrilobular emphysema
- J43.8 Other emphysema
- J43.9 Emphysema, unspecified
- J44.0 Chronic obstructive pulmonary disease with acute lower respiratory infection
- J44.1 Chronic obstructive pulmonary disease with (acute) exacerbation
- J44.9 Chronic obstructive pulmonary disease, unspecified

Principal discharge diagnosis codes included in cohort if combined with a secondary diagnosis of J44.0 or J44.1:

J96.00 Acute respiratory failure, unspecified whether with hypoxia or hypercapnia
J96.01 Acute respiratory failure with hypoxia
J96.02 Acute respiratory failure with hypercapnia
J96.20 Acute and chronic respiratory failure, unspecified whether with hypoxia or hypercapnia
J96.21 Acute and chronic respiratory failure with hypoxia
J96.22 Acute and chronic respiratory failure with hypercapnia
J96.90 Respiratory failure, unspecified, unspecified whether with hypoxia or hypercapnia
J96.91 Respiratory failure, unspecified with hypoxia
J96.92 Respiratory failure, unspecified with hypercapnia
R09.2 Respiratory arrest

Note: International Classification of Diseases, Ninth Revision (ICD-9) code lists for discharges prior to October 1, 2015 can be found in the *2016 Condition-specific Mortality Measures Updates and Specifications Report* .

Exclusions

Inconsistent or unknown vital status or other unreliable demographic (age and gender) data
Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission
Discharged against medical advice

For patients with more than one eligible admission for COPD in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort. Additional admissions within that year are excluded.

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
The measure counts death from any cause within 30 days of the start of the index admission.

The risk-standardized mortality rate (RSMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted based on the hospital's performance with its observed case mix.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the outcome.

See the *2017 Condition-specific Measures Updates and Specifications Report. Hospital-level 30-day Risk-standardized Mortality Measures* for more details.

Exclusions
Unspecified

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Death

Instruments Used and/or Associated with the Measure

None

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a lower score

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

Risk-Adjustment Variables

In order to account for differences in case mix among hospitals, the measure adjusts for variables (for example, age, comorbid diseases, and indicators of patient frailty) that are clinically relevant and have relationships with the outcome. For each patient, risk-adjustment variables are obtained from inpatient, outpatient, and physician Medicare administrative claims data extending 12 months prior to, and including, the index admission.

The measure adjusts for case mix differences among hospitals based on the clinical status of the patient at the time of the index admission. Accordingly, only comorbidities that convey information about the patient at that time or in the 12 months prior, and not complications that arise during the course of the hospitalization, are included in the risk adjustment.

The measure does not adjust for socioeconomic status (SES) because the association between SES and health outcomes can be due, in part, to differences in the quality of healthcare that groups of patients with varying SES receive. The intent is for the measure to adjust for patient demographic and clinical characteristics while illuminating important quality differences. As part of the National Quality Forum's (NQF's) endorsement process for this measure, the Centers for Medicare & Medicaid Services (CMS) completed analyses for the two-year Sociodemographic Trial Period. Although univariate analyses found that the patient-level observed (unadjusted) mortality rates are higher for dual-eligible patients (for patients living in lower Agency for Healthcare Research and Quality [AHRQ] SES Index census block groups) and African-American patients compared with all other patients, analyses in the context of a multivariable model demonstrated that the effect size of these variables was small, and that the c-statistics for the models are similar with and without the addition of these variables.

Refer to Appendix D of the original measure documentation for the list of comorbidity risk-adjustment variables and the list of complications that are excluded from risk adjustment if they occur only during the index admission.

Standard of Comparison

not defined yet

Identifying Information

Original Title

Hospital-level 30-day RSMR following COPD.

Measure Collection Name

National Hospital Inpatient Quality Measures

Measure Set Name

Mortality Measures

Submitter

Centers for Medicare & Medicaid Services - Federal Government Agency [U.S.]

Developer

Centers for Medicare & Medicaid Services - Federal Government Agency [U.S.]

Yale-New Haven Health Services Corporation/Center for Outcomes Research and Evaluation under contract to Centers for Medicare & Medicaid Services - Academic Affiliated Research Institute

Funding Source(s)

Centers for Medicare & Medicaid Services (CMS)

Composition of the Group that Developed the Measure

This measure was developed by a team of clinical and statistical experts:

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Financial Disclosures/Other Potential Conflicts of Interest

None

Endorser

National Quality Forum - None

NQF Number

not defined yet

Date of Endorsement

2017 Oct 3

Measure Initiative(s)

Hospital Compare

Hospital Inpatient Quality Reporting Program

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2017 Mar

Measure Maintenance

Annual

Date of Next Anticipated Revision

2018 Apr

Measure Status

This is the current release of the measure.

This measure updates a previous version: Specifications manual for national hospital inpatient quality measures, version 5.0b. Centers for Medicare & Medicaid Services (CMS), The Joint Commission; Effective 2015 Oct 1. various p.

Measure Availability

Source available from the QualityNet Web site .

Check the QualityNet Web site regularly for the most recent version of the specifications manual and for the applicable dates of discharge.

Companion Documents

The following are available:

Hospital compare: a quality tool provided by Medicare. [internet]. Washington (DC): U.S. Department of Health and Human Services; [accessed 2017 Oct 3]. This is available from the Medicare Web site .

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 Medicare hospital quality chartbook. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017. Available from the Centers for Medicare & Medicaid Services (CMS) Web site .

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific mortality measures updates and specifications report: supplemental ICD-10 code lists for use with claims for discharges on or after October 1, 2015. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017. Available from the QualityNet Web site .

NQMC Status

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Copyright Statement

Production

Source(s)

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific measures updates and specifications report: hospital-level 30-day risk-standardized mortality measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 98 p. [29 references]

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